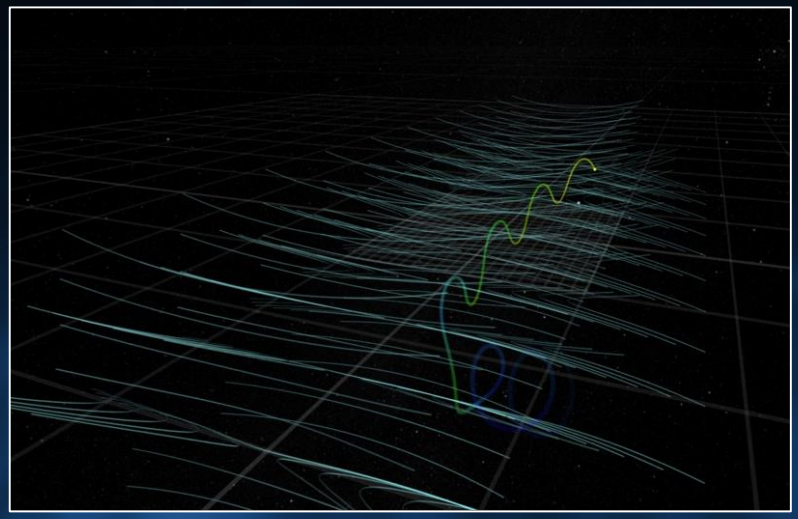
Targeting Elusive Electrons with MMS

High above Earth, particles are often accelerated to extreme speeds. Finding these regions where electrons are accelerated is key to understanding one of the mysteries of the magnetosphere: How does the magnetic energy seething through the area get converted to kinetic energy via magnetic reconnection?

New research using data from NASA's Magnetospheric Multiscale Mission, or MMS, has found a novel way to help locate regions where electrons are accelerated.

Scientists have previously looked at low-energy electrons to find such acceleration zones, but a group of scientists led by Matthew Argall of the University of New Hampshire in Durham have shown it's possible, and in fact easier, to identify these regions by watching high-energy electrons. The team noted that electrons at the edge of the magnetosphere — an area packed with magnetic field lines and high-energy particles — often move in rocking motions as they are accelerated.

Finding a smoking gun for these acceleration zones will make it easier for scientists to identify and study these regions and in turn learn what drives the electrons' intense speeds.



MMS has found a way to more easily identify regions where electrons are accelerated within the magnetosphere – key areas to observe when trying to determine how magnetic energy is converted to kinetic energy during magnetic reconnection. By studying such areas in accessible regions near Earth, we can apply the lessons learned to the vast array of places that magnetic reconnection happens around the universe: on the Sun, in stars, and near black holes.

Observing such detail relies on the use of MMS's four spacecraft flying in a tight tetrahedral formation. Together they can provide high temporal and spatial resolution measurements of the magnetosphere that allow us to probe very small scales, and this helps us to really pinpoint how energy is being converted through magnetic reconnection.